

# Enhanced Barrier Infrared Detector and Focal Plane Array Development

Completed Technology Project (2015 - 2018)



## Project Introduction

Develop barrier infrared detector technology for the nation's needs in high-performance SWIR (short-wavelength infrared), MWIR (mid-wavelength infrared), and LWIR (long-wavelength infrared) imaging focal plane arrays (FPAs).

Under the enhanced barrier infrared detector and focal plane array project we are developing a compatible family of high-performance SWIR (short-wavelength infrared), MWIR (mid-wavelength infrared), and LWIR (long-wavelength infrared) detectors for focal plane array (FPA) applications. The barrier infrared detectors features infrared absorbers with adjustable cutoff wavelengths. They make use of the unipolar barrier device architecture in which the unipolar barriers serve to reduce generation-recombination dark current, but allow the unimpeded collection of photo-generated carriers. The high-performance, cost-effective infrared detector and focal plane array technology has a variety of potential applications. The main applications include infrared imaging systems and imaging spectrometers. The cost-effective infrared detector and imaging focal plane array technology under development in this project provides high FPA performance (high operability, high uniformity, high operating temperature, low  $1/f$  noise). It is suitable for infusion into operational systems of many NASA, Defense, and industrial applications.

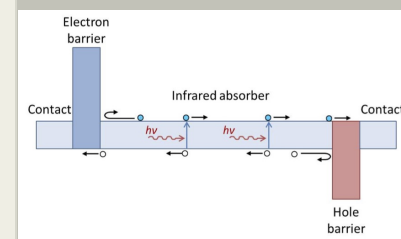
## Anticipated Benefits

The cost-effective infrared detector and imaging focal plane array technology under development in this project provides high FPA performance (high operability, high uniformity, high operating temperature, low  $1/f$  noise). It is suitable for infusion into operational systems of many NASA funded missions where there is a need for infrared focal plane arrays, including infrared imaging systems and imaging spectrometers.

Enables new instrument concepts in infrared imaging or infrared spectral imaging for planetary and earth missions.

This technology project will demonstrate & validate a reliable, capable, and cost effective infrared detector and focal plane array technology that can be used for commercial space ventures.

High-performance, cost effective infrared imaging focal plane array technology is highly beneficial for defense and National Security applications.



Project Image Schematic illustration of the energy band diagram of a complementary barrier infrared detector (CBIRD) structure. The infrared absorber is surrounded by a unipolar electron barrier on the left, and a unipolar hole barrier...

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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory (JPL)	Lead Organization	NASA Center	Pasadena, California

### Primary U.S. Work Locations

California

## Organizational Responsibility

### Responsible Mission Directorate:

Mission Support Directorate (MSD)

### Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

### Responsible Program:

Center Independent Research & Development: JPL IRAD

## Project Management

### Program Manager:

Fred Y Hadaegh

### Project Manager:

Fred Y Hadaegh

### Principal Investigator:

David Z Ting

### Co-Investigators:

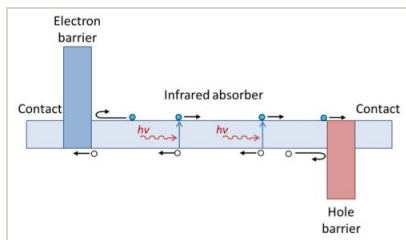
Sarath D Gunapala  
Alexander Soibel

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## Images

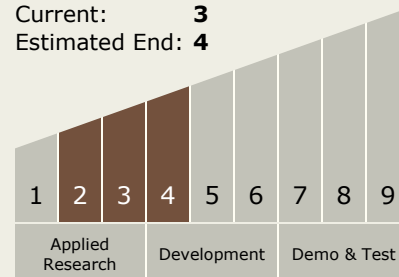


### JPL\_IRAD\_Activities Project Image

Project Image Schematic illustration of the energy band diagram of a complementary barrier infrared detector (CBIRD) structure. The infrared absorber is surrounded by a unipolar electron barrier on the left, and a unipolar hole barrier on the right. (<https://techport.nasa.gov/image/26096>)

## Technology Maturity (TRL)

Start: **2**  
Current: **3**  
Estimated End: **4**



## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.1 Detectors and Focal Planes

## Target Destinations

Earth, Others Inside the Solar System, Foundational Knowledge

## Supported Mission

Type  
Push